

# PRESSURE-SENSITIVE PAPER-PLASTIC FILM LAMINATE TAPE

## Cross-Reference To Related Applications

This application is a continuation of application  
5 09/258,766 filed February 26, 1999, which is a continuation-  
in-part of application 08/209,405 filed March 14, 1994, now  
U.S. patent 5,962,099, which is a continuation-in-part of  
application 07/975,080 filed January 9, 1992, now abandoned.

## 10 Field of The Invention

This invention relates generally to pressure-sensitive  
sealing tapes, and more particularly to a paper-plastic film  
laminate tape of exceptional strength and sufficient body to  
enable the tape to be dispensed in a conventional tape  
15 dispenser machine.

## Background Art

US patent 4,351,877 to Williams discloses a sealing tape  
for cartons, formed of a high-strength face ply of synthetic  
plastic film material, laminated to a base ply of paper whose  
20 outer surface is coated with a remoistenable adhesive. This  
tape is wound into a roll and is dispensed from a standard  
Kraft paper tape-dispensing machine which includes a water  
reservoir to moisten the adhesive coating as the tape is  
advanced out of the dispenser.  
25

As pointed out in the Williams patent, though a sealing  
tape formed from a thin film of synthetic plastic material is  
much stronger than a Kraft paper tape, particularly if the  
film tape is stretch-oriented, a roll of such film tape  
cannot be dispensed in a Kraft paper tape-dispensing machine.  
30

The reason for this is that the machine relies on the  
longitudinal stiffness of the paper tape to unwind it from  
the roll and force it through the outlet of the dispenser  
where the tape is cut to a desired length. A thin plastic  
film is unable to be dispensed lengthwise from a Kraft paper  
35 or a similar dispenser machine because the flexible plastic

film tape is inherently flabby and lacks sufficient rigidity or stiffness for this purpose.

In order, therefore, to add sufficient rigidity to the tape so that it can be properly dispensed, Williams laminates a paper ply to the plastic film ply. To effect lamination of the paper ply to the plastic ply, Williams uses a conventional glue for this purpose. Should this glue be a hot melt adhesive of the type ordinarily used to laminate paper to film, the resultant heat would impair the orientation and strength of the film.

Our related U.S. Patents 5,780,150 and 5,804,024 disclose a paper-film laminate sealing tape having a base ply of oriented film, cold-laminated by a water-based adhesive to a paper face ply so that its orientation is maintained, the exposed surface of the film base ply being coated with a remoistenable adhesive. The present invention resides in a pressure-sensitive paper-plastic film laminate tape which is applied to a surface to be sealed by pressure as distinguished from a tape, as in Williams, and in our earlier application in which the adhesive layer is remoistenable.

#### SUMMARY OF THE INVENTION

In view of the foregoing, the main object of this invention is to provide a paper-plastic film laminate for use in a pressure-sensitive sealing tape that has exceptional strength and sufficient body to enable the tape to be dispensed in a conventional pull-and-tear tape dispenser.

More particularly an object of the invention is to provide a tape of this laminate in which a plastic film ply, biaxially-oriented to impart high-strength thereto, is cold laminated to a paper ply by a water-based adhesive so, that lamination is effected without heat that would impair the orientation and strength of the plastic film ply.

A significant feature of a tape that includes a laminate in accordance with the invention is that it is highly-resistant to delamination and when stripped from a carton or other article, it is removed therefrom in toto.

Briefly stated, these objects are attained in a laminate for use in a pressure-sensitive tape for sealing cartons and for other applications requiring a flexible material of exceptional strength and of sufficient body so that the material in roll form may be dispensed from a conventional pull-and-tear tape dispenser.

In a preferred embodiment, the invention is directed to a pressure sensitive sealing tape product adapted to adhere to various items in applications involving taping and sealing, and having sufficient body to permit dispensing from a conventional pull and tear tape dispenser. The tape product includes a laminate made of a paper layer and a water-impermeable plastic film layer having a first corona-discharge treated surface. In one embodiment, the film layer of the laminate further includes a second surface opposed to the first, corona-discharge treated surface. The second surface is not corona-discharge treated, thus ensuring that adjacent, overlapping layers of the laminate or tape do not adhere to each other when wound on, e.g., a pull and tear dispenser.

Preferably, the first corona-discharge treated surface of the plastic film layer is adhesively laminated to the paper layer to form a paper-plastic film laminate having first and second opposed outer surfaces. The laminate additionally includes a layer of a pressure-sensitive adhesive coating on one of the first and second outer surfaces. The pressure-sensitive adhesive coating is exposed for use in adhering the paper-plastic film laminate to various items. The plastic film layer has a sufficient strength to allow the film to be stripped in one piece from an item to which the laminate is adhered.

The laminate and tape products of the invention may optionally further include a layer of a release agent located upon a remaining uncoated outer surface. Preferred release agents for use with the invention include the silicones.

In another embodiment of the invention the paper layer has a thickness of from about 3 to about 6 mils, while the

plastic film layer has a thickness of from about 1 to about 3 mils.

Advantageously, the plastic film component of the pressure sensitive sealing tape product is an oriented film comprising a polymer selected from the group consisting of polypropylene, polyethylene and polyester. Also, the paper layer preferably comprises Kraft paper.

In a preferred embodiment, the first corona discharge treated surface of the plastic film layer may be adhesively laminated to the paper layer by a water-based adhesive. The water-based adhesive may include, for example, an acrylic copolymer composition or a polyvinyl acetate copolymer. The pressure sensitive adhesive preferred for use with the invention may be selected from among rubbers, vinyl rubbers, polyvinylethers, polyvinylbutyrals, polyisobutylenes and acrylics. The pressure sensitive adhesive may be applied to either the paper side or the film side of the laminate. Additionally, if desired, an outer surface of the plastic film layer may be metallized.

It is desirable, in forming the pressure sensitive laminate of the present invention, to utilize an adhesive for laminating the first corona discharge treated surface to the paper layer which will produce a stronger bond than that produced by the pressure sensitive adhesive to allow the paper-plastic film laminate to be stripped off of an item to which it is adhered in one piece.

In another embodiment, the pressure sensitive laminate of the invention comprises a paper layer having a first surface and a second opposed surface; an oriented, water impermeable plastic film having a first corona discharge treated surface and a second, opposed surface, wherein the first corona discharge treated surface is adhesively laminated to the first surface of the paper layer to form a paper-plastic film laminate; an exposed layer of a pressure-sensitive adhesive coating upon the second surface of the paper layer; and a layer of a release agent located upon the second, opposed surface of the plastic film. The plastic

layer incorporated in the above-described embodiment should have sufficient strength to allow the film to be stripped in one piece from an item to which the laminate is adhered.

5 In a further embodiment the invention is directed to a pressure-sensitive sealing tape product for adhering to various items in applications involving taping and sealing, wherein the tape product includes the laminate in order to possess sufficient body to permit dispensing it from a conventional pull and tear tape dispenser. The tape product  
10 comprises one of the laminates described herein.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention as well as other objects and features thereof, reference is made to the detailed description of the invention and the accompanying  
15 drawing wherein:

Fig. 1 is a section taken through a preferred embodiment of a sealing tape in accordance with the invention, the scale of the tape being magnified;

20 Fig. 2 shows the tape in roll form loaded into a tape dispenser; and

Fig. 3 shows the tape being stripped off a carton.

#### DETAILED DESCRIPTION OF THE INVENTION

25

##### The Tape:

Referring now to Figs. 1 and 2, one preferred embodiment of a sealing tape T in accordance with the invention includes a base ply 10 formed of Kraft or other paper sheeting. Base  
30 ply 10 is cold laminated by an adhesive layer 11 to a film ply 12 of high-strength, synthetic plastic film, such as polyethylene. Preferably the film is formed of a biaxially oriented material, such as polypropylene or polyester (MYLAR). The inner surface of film ply 12 is rendered  
35 wettable by a corona-discharge treatment to enhance the energy at this surface so that it is receptive to adhesives.

Coated on the exposed surface of paper base ply 10 is a pressure-sensitive adhesive layer 13, so that the sealing tape can be adhered to a carton, a package or other article. The pressure-sensitive layer 13 may be any suitable pressure-sensitive adhesive, such as rubber, vinyl rubber, polyvinylether, polyvinylbutyral, polyisobutylene or acrylic. The tape acts to close the flaps or joints of the carton or to carry out any other conventional sealing function.

The plastic film face ply 12 is no greater than 3 mils in thickness and is preferably about one mil in thickness; hence, by itself, it lacks rigidity and body. The Kraft paper base ply 10 is thicker, preferably being 2 or 3 mils thick, but no greater than about 6 mils, thereby imparting a measure of stiffness and body to the tape.

When film ply 12 is biaxially-oriented, it has exceptional tensile strength, such orientation being effected by stretching the film along both its transverse and horizontal axes to molecularly orient the film structure. The strength of the thicker paper base ply 10, per se, is not high, but the paper-film laminate has both body and high strength, so that a roll of the tape can be used in a conventional pull-and-tear tape dispenser.

Cold lamination of the plies is effected by a water-based adhesive, preferably a polyacrylic copolymer composition having an affinity both for the paper ply and the film ply. Because the water-based adhesive is fluid at ambient temperature and is not a hot melt adhesive; no heat is applied to the biaxially-oriented film as it is being laminated to the paper ply. A water-based adhesive, once cured, is not water soluble and is not remoistenable.

It is important to bear in mind that a biaxially-oriented film is heat-sensitive and that at elevated temperatures, the film relaxes and loses its molecular orientation and strength. It is known, for example, that when two sheets of biaxially-oriented polyester film are seamed together, using an ultrasonically-activated sealing bar for this purpose which creates internal friction and heat

within the film, this causes the superposed films to soften and fuse. The resultant sealing line is weak, and the sheets then tend to tear along this line. Cold lamination is therefore essential to the present invention in order to  
5 produce a tape paper- film laminate of high strength.

It is to be noted that a synthetic plastic film material, such as polypropylene, is normally not receptive to adhesives, especially water-based adhesives. Hence if one were to apply to the surface of this film a water-based  
10 adhesive which is flowable at ambient temperature or at a temperature somewhat above ambient but not at the elevated temperature of a hot melt adhesive, the adhesive will not be adsorbed by the film.

Essential to the invention is that the inner surface of the film forming the face ply of the tape be treated so as to  
15 render it wettable and hence receptive to adhesives. To this end, this surface is subjected to a corona discharge treatment which enhances the surface energy, as measured in dynes, and thereby renders the surface wettable to allow for better bonding of the adhesive applied thereto. The  
20 resultant bond both to the film and the paper is so strong that the tape is highly resistant to delamination.

It is important that the film surface be subjected to corona-discharge treatment shortly before adhesive is applied thereto, for the effect of such treatment has a relatively  
25 short duration. Thus if after such treatment, the film is stored for several days or longer before being converted into a tape, the wettability of the film surface will be greatly diminished.

Because of the pressure-sensitive adhesive layer 13  
30 which coats the outer surface of the paper base ply 10, should the tape be coiled to form a roll, the convolutions of the roll would stick together, giving rise to what is called "blocking," so that one could not then unwind the roll. To prevent such blocking, the outer surface of film face ply 12  
35 is coated with a silicone or other release agent 14 of the

type commonly used in "Scotch" brand and other pressure-sensitive plastic film tapes which come in roll form.

The resultant roll 15, shown in Fig. 2 is loaded into a pull-and-tear tape dispenser 16 suitable for a pressure-sensitive tape, the dispenser, including a cutting blade 17 at its outlet. Thus the tape drawn from roll 15 is extended through the outlet, and a desired length thereof cut off by blade 17.

Fig. 3 shows a corrugated board carton 18 having complementary flaps which are sealed by a paper-plastic film laminate type T in accordance with the invention. When tape T is so applied, its paper-base ply 10 is adhered by the pressure-sensitive adhesive layer thereon to the flaps of the carton to close the carton. The strength of the adhesive bond between the plastic film ply and paper ply of the tape is greater than the pressure-sensitive adhesive bond between the paper ply 10 and the flap of the carton. In order to later open the carton, one strips off tape T in toto. This action causes surface fibers on the cardboard flaps to be ripped off and to adhere to the pressure-sensitive adhesive layer. But no part of the tape remains on the carton; hence the carton can be recycled in a paper recycling facility.

The outer surface of the plastic film ply may be metallized as by vacuum deposition to provide a decorative sealing tape. And if the nature of the synthetic plastic material forming the plastic ply is such that it has inherent release characteristics and therefore does not require coating with a release agent, the outer surface of this ply may be corona-discharge treated to render it receptive to printing inks, so that this surface may be decoratively or otherwise printed.

Also in practice, the pressure-sensitive adhesive coating may be applied to the plastic film side of the laminate instead of the paper side, as previously disclosed, in which case the release agent for preventing blocking is applied to the paper side of the laminate. And in this embodiment of the tape, since the pressure-sensitive adhesive



is coated on the exposed side of the film ply, the surface of this ply must first be corona-discharge treated to render it receptive to the adhesive.

In manufacturing a tape in accordance with the invention, a laminate of the type disclosed in our U.S. Patents 5,780,150 and 5,804,024 may be used to corona-discharge treat a plastic web before it is adhered to a paper web to produce a paper film laminate web. This laminate web is then slit into tapes of the desired width.

While there has been disclosed preferred embodiments of the invention, in practice, many changes may be made in the tape without departing from the spirit of the invention. Thus one may make a three-ply pressure sensitive tape whose core is an oriented film cold-laminated on both sides to paper plies by a water-based adhesive a pressure sensitive adhesive coating one paper ply, the other paper ply being reserved for printing.